PERIPHERAL MOTOR NERVE CONDUCTION STUDIES IN PATIENTS WITH CHRONIC CHAGAS' DISEASE

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SUMMARY — A comprenhensive investigation of nerve motor conduction velocity was carried out in the ulnar nerve of 70 patients in the chronic stage of Chagas disease. It was found that 2.6% of them, had slowness of the large motor axons at distal segments and 14% at proximal segments. Twenty seven percent of them had also slowness of conduction at the smallest motor fibers. These observations signal that some patients in the chronic stage of the infection may develop a motor neuropathy.

Estudos de condução em nervos motores periféricos de pacientes com doença de Chagras crônica

RESUMO — Foi feita investigação da velocidade de condução motora no nervo ulnar de 70 pacientes em fase crônica da doença de Chagas. Foi verificado que 2,G% deles apresentavam lentificação em grandes axônios motores em segmentos distais e 14% em segmentos proximais: 27% deles apresentavam também condução lentifiçada em pequenas fibras motoras. Essas observações indicam que alguns pacientes na fase crônica da doença podem desenvolver uma neuropatía motora.

The involvement of the peripheral nervous system in the chronic stage of Chagas' disease has been demonstrated in the last decade, both in humans i,io,ii,i3 and in mice 3,8. One of the features which characterizes that compromise in man is demyelination and loss of sensory fibers within the peripheral nerve 12. The same type of nerve fiber lesion could be observed in the sciatic nerve of mice infected with tryposmastigotes of the CA-I and Tulahuen strains of the parasite 6.7. Surprisingly, few data regarding the state of the peripheral nerve motor fibers in chronic infected people have been reported. References can be found in the earlier papers of Sanz et al.9, DeFaria et al.i and Sica et al.[1]^ who studied the maximal motor nerve conduction velocities and did not find major differences when they compared patients and controls. An obvious limitation for a deeper investigation of these fibers in man is the impossibility of perfoming motor nerve biopsies.

The aim of the present study has been to obtain some more information about the state of the nerve motor fibers in patients who have reached the chronic stage of the disease by employing electrophysiological techniques able to search for the state of the smaller motor fibers and the conduction speed of the largest at their proximal segments.

MATERIAL AND METHODS

Patients — Altogether 70 patients were investigated. Twenty three of them were females and 47 were males. Their ages ranged between 11 and 49 years. The diagnosis of Chagas' disease was done at the Instituto Nacional de Diagnóstico y Tratamiento de la Enfermedad de Chagas at Buenos Aires. None of the patients had received any treatment related to the infection. Other causes of nervous damage were excluded by rejecting patients over 60 years

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old 14 and also those who had had toxic, metabolic, infectious or genetic disorders known to induce neurological involvement. Controls: Sixty one healthy and non-selected subjets, with negative tests for Chagas' disease were employed as controls. Thirty two of them were females and 29 were males. Their ages ranged between 11 and 54 years.

Techniques — All the procedures were conducted in the ulnar nerve, with the subject lying on a couch, in a semi-dark and warm room whose ambient temperature was mantained between 26«? and 28?C. Electrodes: The recording electrode was a strip of silver foil, 4 cm long and 0.5 cm wide, coated with electrode jelly and fixed to the skin of the hypothenar region overliyng the end-plate area of the adductor digiti minimi muscle. The reference electrode was also a silver strip wrapped around the proximal phalanx of the index finger. The earth electrode was a lead plate situated at the dorsum of the hand. The stimulating electrodes were a pair of chlorided silver discs, 0.8 cm in diameter each, space 2 cm appart in a plastic holder, with the cathode distal.

Procedures — The following studies were carried out. (a) Distal motor nerve maximal conduction velocity (DMMCV): For obtaining this measurement the conventional procedure was used. So, supramaximal isolated nerve stimuli were delivered on the nerve at three different points, namely the axilla, the elbow and the wrist. Then, the latencies of the muscle responses were measured at the starting of the first deflection which always was negative, (upwards), (b) Proximal motor nerve maximal conduction velocity (PMMCV): For this purpose the latency value of the F wave was obtained. This potential was elicited by supramaximally stimulating the ulnar nerve at the wrist and ten responses were measured in the oscilloscope screen. The mean latency value of these responses was used for the estimations. Two types of calculations were done, one of them allows to estimate the conduction velocity all along the way the F wave travels, namely the motor axon up and down, and the other only the segment running between the axilla and the spinal cord. For the first type of estimation the formula developed by Kimura was used 5, while for the second the one described by Fernandez Liguori et al. was employed 2. (c) Slow motor nerve conduction velocity (SMCV): For this study the technique described by Hopf 4 was used.

RESULTS

Findings are summarized in Figure 1.

From 41 patients in whom DMMCV was explored, only one (2.6%) had values below the lowest control limit in the segment between axilla and elbow and 5 (12%) between elbow and wrist.

When PMMCV was investigated in 41 patients it was found that S of them (?%) showed abnormal values with the Kimura's estimation and 6 (14%) with the Fernandez Liguori's formula.

Finally, from 29 patients who were submitted to the Hopf method (SMCV), 8 of them (27%) gave figures below the lowest normal limit.

COMMENTS

The results obtained in the present study signal that the largest motor fibers within the peripheral nerve are seldom involved. Data from this investigation show that they may be demaged either at their distal (elbow to wrist) or proximal (axilla to spinal cord) segments with relative sparement of intermediate (axilla to elbow) levels. The distal slowness of conduction suggests that the neuropathy may be mainly of the axonal-neuronal type. Nevertheless, we cannot deny the possibility oi demyelination at the most proximal segments of the axons close to their exit from the spinal cord.

However, the most remarkable finding was the observation that a larger proportion of patients showed selective impairment of conduction velocity in the slowest conducting motor fibers.

In a previous paper, Sica et al. found in biopsies of the sural nerve obtained from patients in the chronic stage of the disease that sensory fibers were affected by axonal degeneration and segmental demyelination. Drawings of fiber diameter histograms showed loss of large and small diameter fibers. Despite that in the**

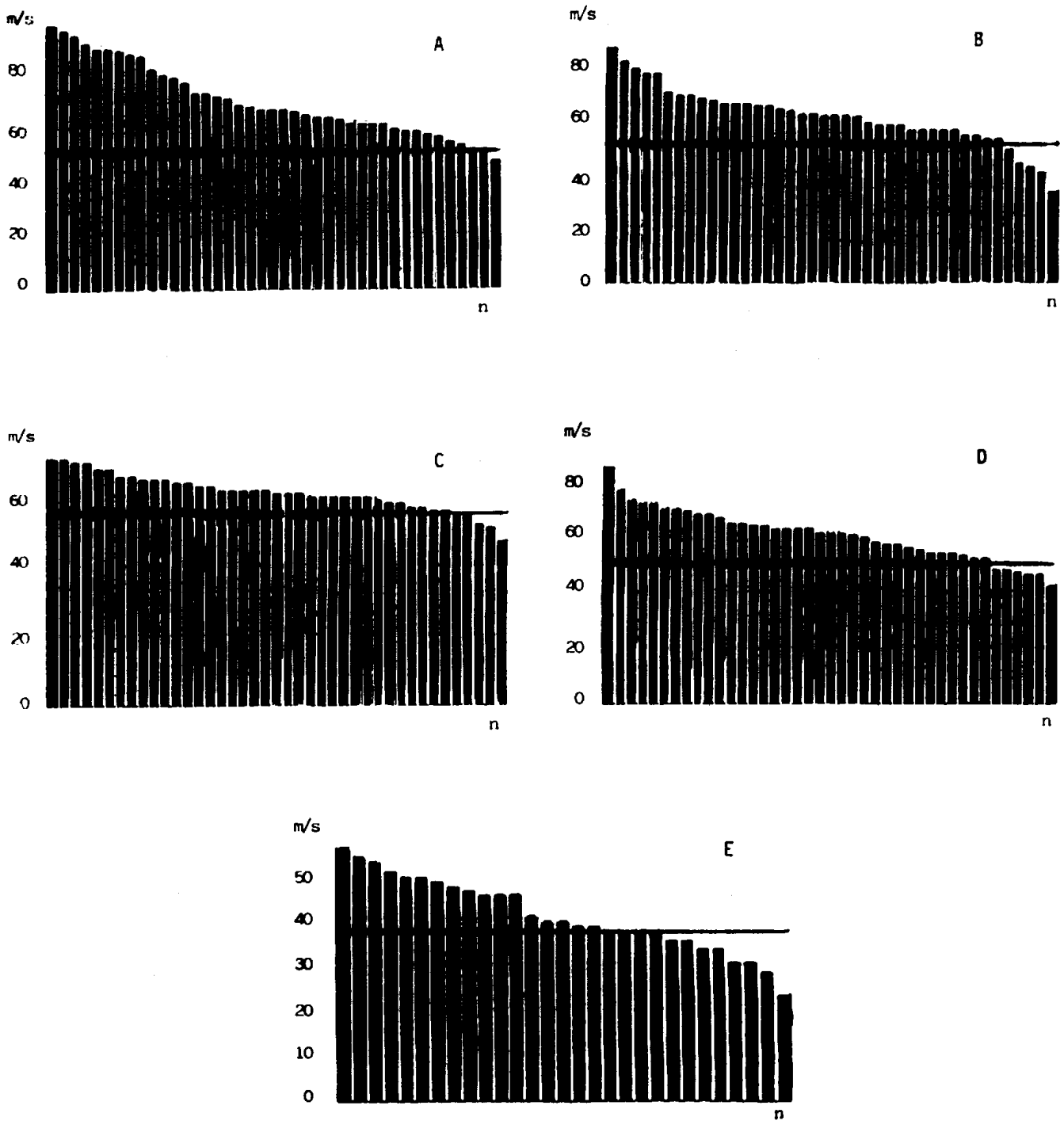

Fig. 1 — (A) DMMCV between axilla and elbow. (B) DMMCV between elbow and wrist. (C) F wave conduction velocity estimated by Kimura's formula. (D) F wave conduction velocity estimated by Fernandez L.'s formula. (E) SMCV horizontal bar signals the lowest limit of the control group.

present investigation we did not obtain anatomical samples of motor nerves, the electrophysiological data suggest that large and small motor axons may as well be involved in these patients. This observation is also well in line with the findings done in mice experimentally infected with CA-I or Tulahuen strains trypomastigotes, where the sciatic nerve revealed diminution of myelin fibers content, axonal degeneration and segmental and paranodal demyelination 3.6,7.

Taken together, these pieces of clinical and experimental evidence support the notion that some patients, who reach the chronic stage of the infection, may develop a sensory, a motor or a mixed neuropathy as part of the peripheral nervous system involvement which occurs in this disease.

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